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ABSTRACT

This paper explains the process by which Middlesex County College (MCC) translated a taxonomy of the functions of dental x-ray technologists into a curriculum guide for its dental radiography program. After noting the limited use of taxonomies, the paper describes MCC's curriculum project during which: (1) the developing a curriculum (DACUM) process was used to involve dental professionals in identifying the major duties of a dental x-ray technologist; (2) a taxonomy of functions was developed based on these identified duties; (3) lesson guides were prepared for each step in the taxonomy and were later reviewed by radiography instructors and administrators; and (4) the final draft of the curriculum guide was prepared focusing on 11 major duties, and the tasks and steps necessary to perform each. The next section explains the way in which the taxonomy of functions was translated into lesson guides, focusing on the hierarchical relationship of occupational clusters, jobs, duties, tasks, and steps; and the numbering system employed. Next, the course goal of exposing radiographs is used as an example to show the relationship among job analysis terms, the numbering system, taxonomic examples, and the writing of goals and objectives. Finally, a sample lesson guide is provided to illustrate the taxonomy-curriculum linkage. (HB)

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TRANSLATION OF A TAXONOMY INTO A CURRICULUM GUIDE

by

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Kan Yagi, et al., (1971) wrote, "Taxonomies have a particular penchant for "getting lost" after the initial development stages. It is very hard to find one that has actually been put to use and remains in use" (p.5). In 1983 this observation still has validity. There is, however, one recent curriculum project, DENTAL RADIOGRAPHY: A CURRICULUM GUIDE FOR DENTAL X-RAY TECHNOLOGISTS, in which the taxonomy developed was directly translated into a curriculum guide. Whether the taxonomy will remain in use for this curriculum remains to be determined.

The first reason for taxonomies not being used is that they are not completely understood by many educators. A second reason is that taxonomies are not fully developed to the step/element level for effective curriculum construction. Many curriculum projects specify duties and tasks but are not based on a taxonomy, that is a systematic classification of competencies developed to the step or element level.

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A typical example of this lack of full development can be seen by examining the Vocational-Technical Education Consortium of States (VTECS) catalogs, such as the Cave and Hill (1980) curriculum on the MEDICAL ASSISTANT.

Curriculum Project

In September 1981, Middlesex County College, Edison, New Jersey, received a grant from the New Jersey Department of Education, Division of Vocational Education and Career Preparation to develop a competency-based dental radiography curriculum guide. The project was conducted in two phases. During phase one, curriculum content was determined through the DACUM process. The DACUM process involves individuals employed in a specific occupation to identify the competencies needed to perform the job. On two evenings eight dental auxiliaries and two dentists met with the DACUM workshop leader, in a group setting, and reached a consensus on the occupational definition of a dental x-ray technologist and generated a list of major duties necessary to function in that capacity.

The second phase of the project consisted of developing a competency-based curriculum guide utilizing, as a foundation, the results of the job analysis obtained through the DACUM process. Three curriculum writers, the curriculum consultant, the project director, and the project coordinator developed the taxonomy of functions and subsequent lesson guides. This team met over eighty hours to develop the taxonomy based upon the major duties previously identified. During this phase, sample

test items were developed and submitted to the test consultant for review and validation. A rough draft of the taxonomy and a lesson guide for each step was prepared, duplicated and distributed to the participants at a workshop for all New Jersey radiography instructors and administrators for their review and recommendations. Comments received after the workshop were carefully reviewed and, where applicable, incorporated into the final draft of the curriculum guide.

The completed dental radiography curriculum guide contains eleven major duties and the tasks and steps necessary to perform each duty. Each lesson guide contains the duty, task, and step pertinent to that lesson, a performance objective, and an area for the instructor to indicate the teaching strategy, and an area to estimate the time required to teach that lesson. The majority of the lesson guides also contain references and sample test items.

Translation into a Curriculum

In order to explain the translation of a taxonomy of functions (Figure 1) of a dental x-ray technologist to the lesson guides, the following illustration (Figure 2) seems appropriate. Note that on the left side the job analysis terms are given. An occupational cluster is a group of jobs that are related on the basis of the type of materials and equipment worked upon, subject matter content needed, or technical concepts involved. A job

5. Exposing Occlusal Size Radiographs Extraorally

5.1 Preparing Armamentarium

5.1.1 Inventorying armamentarium
5.1.2 Obtaining occlusal film
5.1.3 Identifying and marking film

5.2 Maintaining Asepsis Chain

5.2.1 Washing hands
5.2.2 Disinfecting armamentarium before and after procedure
5.2.3 Wearing protective coverings

5.3 Interacting with Patient

5.3.1 Identifying patient, self
5.3.2 Assessing patient's overall appearance
5.3.3 Escorting patient to radiographic area
5.3.4 Assisting patient safely into dental chair
5.3.5 Explaining procedure to reassure patient
5.3.6 Removing and safeguarding patient's personal belongings

5.4 Reading Charts

5.4.1 Reviewing patient information
5.4.2 Confirming questionable orders
5.4.3 Suggesting beneficial changes

5.5 Practicing Safety Procedures

5.5.1 Monitoring self
5.5.2 Monitoring patient
5.5.3 Monitoring personnel
5.5.4 Maintaining armamentarium

5.6 Inspecting Oral Cavity

5.6.1 Determining if further asepsis is needed
5.6.2 Removing intraoral prosthesis

Figure 1. Taxonomy of Dental X-Ray Technologists for the Major Duties of Exposing Occlusal Size Radiographs Extraorally and Exposing Panographic Radiographs. [Note: Nine other duties are included in the complete taxonomy.]

5.7 Implementing Procedure

5.7.1 Activating x-ray unit
5.7.2 Calibrating x-ray unit
5.7.3 Positioning patient for maxillary exposure
5.7.4 Placing occlusal film for maxillary exposure
5.7.5 Directing position indicating device for maxillary exposure
5.7.6 Positioning patient for mandibular exposure
5.7.7 Placing occlusal film for mandibular exposure
5.7.8 Directing position indicating device for mandibular exposure
5.7.9 Reiterating patient instruction
5.7.10 Evaluating extraoral occlusal technique
5.7.11 Exposing occlusal film
5.7.12 Identifying radiograph

5.8 Terminating procedure

5.8.1 Deactivating x-ray unit
5.8.2 Replacing armamentarium in safe, proper position
5.8.3 Returning all personal belongings to patient
5.8.4 Assisting patient safely out of dental chair
5.8.5 Escorting patient from radiographic area

6. Exposing Panographic Radiograph

6.1 Preparing Armamentarium

6.1.1 Inventorying armamentarium
6.1.2 Selecting correct film and cassette
6.1.3 Utilizing correct darkroom lighting
6.1.4 Placing and securing film properly in cassette
6.1.5 Identifying and marking cassette
6.1.6 Placing cassette in x-ray unit

6.2 Maintaining Asepsis Chain

6.2.1 Washing hands
6.2.2 Disinfecting armamentarium before and after procedure
6.2.3 Wearing protective coverings

6.3 Interacting with Patient

6.3.1 Identifying patient, self
6.3.2 Assessing patient's overall appearance
6.3.3 Escorting patient to radiographic area
6.3.4 Assisting patient safely into dental chair
6.3.5 Explaining procedure to reassure patient
6.3.6 Removing and safeguarding patient's personal belongings

(Figure 1 continued)

6.4 Reading Charts

6.4.1 Reviewing patient information
6.4.2 Confirming questionable orders
6.4.3 Suggesting beneficial changes

6.5 Practicing Safety Procedures

6.5.1 Monitoring self
6.5.2 Monitoring patient
6.5.3 Monitoring personnel
6.5.4 Maintaining armamentarium

6.6 Inspecting Oral Cavity

6.6.1 Determining if further asepsis is needed
6.6.2 Removing intraoral prosthesis

6.7 Implementing Procedure

6.7.1 Activating x-ray unit
6.7.2 Positioning patient
6.7.3 Head positioning
6.7.4 Calibrating machine according to jaw measurements
6.7.5 Reiterating patient instruction
6.7.6 Evaluating panographic technique
6.7.7 Exposing panographic film
6.7.8 Removing cassette

6.8 Terminating Procedure

6.8.1 Deactivating x-ray unit
6.8.2 Replacing the armamentarium in safe, proper position
6.8.3 Returning all personal belongings to patient
6.8.4 Assisting patient safely out of dental chair
6.8.5 Escorting patient from radiographic area

(Figure 1 continued)

Analysis Terms	Classification Systems	Taxonomic Examples
Occupational Cluster	079.371-010	Dental Assisting
Job		Dental X-ray Technologist
Duty	6.	Exposing Panographic Radiograph
Task	6.1	Preparing the Armamentarium
Step	6.1.1	Inventorying the Armamentarium

Figure 2 Analysis Terms, Classification Systems, and Taxonomic Examples

within that cluster consists of the duties, tasks, and steps performed by an individual. A duty is a logical division of a job into related tasks for descriptive purposes. Duties are stated as areas of responsibility, with action words ending in 'ing.' A task is a unit of work that constitutes a logical and necessary function in the performance of a duty. Two or more tasks constitute a duty. A step is an action which is a logical segment of a task. Two or more steps constitute a task.

The numbers (center) are representative for the various classification systems for dental assisting and to correspond to the taxonomy. For example, dental assisting, as an occupational cluster, could be assigned any of the following:

Census Code	921
Bureau of Labor Standards (BLS)	70060050
United States Office of Education (U.S.O.E.)	070101
DICTIONARY OF OCCUPATIONAL TITLES	079.371-010
STANDARD OCCUPATIONAL CLASSIFICATION MANUAL	5232
Standard Occupational Classification	07.0199

The above numbers are used to collect data for reporting purposes.

Beginning at the duty level is an arbitrary numbering system (6., 6.1, & 6.1.1) used in this curriculum for convenience of development and filing. Please note that this numbering system would allow one to easily file the curriculum into a computer.

On the right side of Figure 2 are some corresponding examples from the taxonomy. That is, within the occupational cluster Dental Assisting, one job is the dental x-ray technologist in

which one of the duties is 6. Exposing Panographic Radiographs. One of the tasks in exposing a panographic radiograph is 6.1 Preparing the Armamentarium.[1] This task consists of several steps, the first being 6.1.1 Inventorying the Armamentarium. Thus each part of the job analysis and taxonomy is systematically linked and identifiable.

To give a total picture of the relationship of the job analysis terms, numbering system, taxonomic examples, and the writing of goals and objectives refer to Figure 3. Dental assisting exists because of societal needs or wants. Within the dental assisting occupational cluster one job is the dental x-ray technologist. A program goal will be to train individuals to successfully complete the state licensing examination. One of the duties (6. in the taxonomy) is exposing panographic radiographs. A course goal would be that each student be able to expose panographic radiographs. Since there are eleven major duties in the taxonomy there would be eleven course goals.

The first task in exposing panographic radiographs is preparing the armamentarium (6.1) which can be stated as a unit goal, referred to in the literature as a terminal goal or objective. The unit goal would be that each student be able to prepare the armamentarium. There would be eight unit goals, i.e., 6.1 to 6.8.

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1 The taxonomy does not contain the term 'the' to save space and avoid repetition.

TERMS	NUMBERS	EXAMPLES	GOALS/OBJECTIVES
Occupational Cluster	079.371-010	Dental Assisting	Societal Need/Want
Job		Dental X-ray Technologist	Program Goal
Duty	6.	Exposing Panographic Radiograph	Course Goal
Task	6.1	Preparing Armamentarium	Unit Goal (Terminal Objective)
Step	6.1.1	Inventorying the Armamentarium	Lesson Level Behavioral Objective (Enabling Objective)

Fig. 3 Terms to Goals and Objectives

One of the steps in preparing the armamentarium is inventorying the armamentarium (6.1.1) which is to be taught in a lesson. A lesson might be minutes or hours in length. At the lesson level an objective can be written that contains three components, i.e., 1) the behavior expected of the student upon completion of the lesson, 2) the conditions under which the student is expected to perform the behavior, and 3) the level of performance when the student will recognize successful performance. This lesson level objective is referred to as the enabling objective in the literature. For this step one objective would be that the student will be able to check the x-ray film for age, i.e., date on package, reporting any outdated film to proper authorities.

All goals and lesson level objectives are to be given to the student prior to instruction. Giving the goals and objectives to the student conforms to Mager's classic statement (1962), "If you give each learner a copy of your objectives, you may not have to do much else" (p.53).

Taxonomy and Lesson Guide

The above description has provided the principles underlying the taxonomy and its direct application to the lesson guide and teaching. An example of a teaching guide is given (Figure 4) to illustrate the taxonomy-curriculum linkage. Refer to Figure 4 in which 5. Exposing occlusal size radiographs extraorally is given. The sixth task in accomplishing that duty is 5.6 Inspecting oral cavity. The second step in the task is 5.6.2 Removing intraoral prosthesis. Note that the guide is directly linked to the duty, task and step. This is the precise methodology in using a taxonomy of functions of a job for developing curriculum.

LESSON GUIDE

OCCUPATIONAL CLUSTER Allied Health - Dental Assisting

JOB Dental X-ray Technologist

5. DUTY Exposing Occlusal Size Radiographs Extraorally

5.6 TASK Inspecting Oral Cavity

5.6.2 STEP Removing intraoral prosthesis

BEHAVIORAL OBJECTIVE: The student will be able to - instruct patient to remove any intraoral removable appliances, and place in container filled with room temperature water, storing in safe area until completion of procedure.

REFERENCE/S: Wolf R. deLyde, 1980, p. 202

TEACHING STRATEGY: X Lecture X Demonstration ___ Laboratory

___ Other Specify: _____

TIME ESTIMATE 8 Minutes

SAMPLE TEST ITEM/S:

Patients wearing intraoral removable appliances should

a. leave them in to stabalize the x-ray film
b. leave them in to prevent blank areas on the radiographs
c. remove appliances and place in a container of room temperature water
d. remove appliances and place in hot water

Figure 4 Lesson Guide

REFERENCES

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